



Leaders of industry, government and academic research efforts converged in Idaho recently to discuss challenges, solutions and new industrial research tools at INL for engineering high-value bioenergy feedstocks.

## Workshop highlights new resource, goals for developing biomass into tradable commodity

By [Nicole Stricker](#), *INL Communications & Governmental Affairs*

National laboratory researchers envision a day when raw materials such as wood chips and corn stalks are transformed into a high-quality commodity traded on the open market beside grain, coal and crude oil.

Scientists already know how to convert grass, stalks and straw into biofuels, but numerous challenges remain to [develop biomass into an industrial-scale commodity](#) that can significantly contribute to the nation's fuel needs. That's why the U.S. Department of Energy recently hosted a workshop with government, university and industry partners to forge a path forward. The group focused on ways to improve the quality of biorefinery starting material.

"Biomass can be a pretty lousy feedstock, and the burden has been on biorefiners to take this poor feedstock and get something valuable out of it," said Kevin Kenney, an INL bioenergy researcher who helped organize the workshop. "There are things we can do in the feedstock supply chain to improve the value and overcome some of the barriers that bioenergy producers face."



***Workshop participants toured the new Feedstock Process Demonstration unit at INL, which allows large-scale testing of new feedstock formulations.***

Roughly 100 workshop participants convened at [Idaho National Laboratory](#) to discuss technical challenges and tour a powerful new research platform based at INL. Specifically, they learned how the new Feedstock Process Demonstration Unit (PDU) enables INL and its research partners to produce large quantities of test materials for bioenergy producers.



Technical presentations and feedback from the workshop will help the Energy Department develop a roadmap to describe the vision, barriers and path forward for developing next-generation bioenergy feedstocks.

"A vision we want to present is that there are a number of technologies that can help to transform biomass into a tradable feedstock commodity," said Richard Hess, manager of INL's Biofuels and Renewable Energy Technology Department. "The PDU alone is not going to get us to the end goal, but is an important tool in getting us to a point where the entire system is better; it fills a gap you can't bridge from the lab."

### Workshop presentations

The [Biomass Preconversion, Formulation and Densification Workshop](#) kicked off Aug. 23 with welcoming remarks from DOE and INL leaders, and both university and industry researchers funded through DOE's Office of Science and its Advanced Research Projects Agency-Energy (ARPA-E), which both co-sponsored the workshop with DOE Energy Efficiency and Renewable Energy's Biomass Program. About half of workshop attendees represented industrial leaders, with the rest hailing from academia, national laboratories and other government entities.

The morning speakers emphasized current research in plant biotechnology to increase crop yields and improve conversion to biofuels, challenges that remain, and how the workshop's diverse attendance is poised to find solutions.

"What I hope will come of this workshop is a dialogue, a transfer of understanding and bringing disparate communities together so their interests can surface and be integrated into a whole approach," said David Hill, INL deputy laboratory director for Science and Technology. "This is an important interaction of industrial expertise and research expertise."

Attendees then broke into groups for a series of presentations focused on three main research areas: preconversion, formulation and densification. These processes for transforming raw biomass into high-quality feedstocks aren't unlike the steps required for converting wheat to flour and then to bread.

Just as wheat is ground into flour before it arrives in the baker's kitchen, preconversion is the mechanical, thermal or chemical breakdown of raw biomass. Formulation is akin to combining the ingredients of a bread recipe — different types of biomass may be mixed together or with other ingredients that improve stability or energy production. Finally, densification is the use of temperature and pressure to set and bind the ingredients together similar to the way an oven bakes bread.

All three of these steps are key to providing bioenergy producers with feedstocks of sufficient quality, quantity and stability. Workshop participants discussed current methods and challenges associated with each process to help illuminate the next steps. Their presentations and discussions were also available via an Aug. 30 webinar.

### Feedstock PDU demonstration

On the second day, participants toured the DOE's new Feedstock Process Demonstration Unit based at INL. The PDU is a pilot-scale research and development platform that is modular, deployable to other locations and accommodates large-scale testing of new approaches.



***A model (foreground) of the Feedstock Process Demonstration unit at INL (background) shows its modular, field-deployable components.***

For example, researchers can test ideas conceived in the lab by producing large quantities of feedstock so bioenergy producers can assess new recipes. Academic or industry researchers can also collect processing data for whatever approach they're studying. The PDU currently includes coarse and fine grinders, a drier, a pellet mill and means for collecting data about particle flow rates, power consumption and other factors.

"The Idaho National Lab PDU is really looking at ways of getting better formats for feedstock so they can be stored for longer periods of time and transported more efficiently over long distances," said Paul Bryan, manager of DOE's Biomass Program.

The PDU now provides a means to take laboratory-scale ideas and work with bioenergy producers to test them. Although biofuels PDUs also exist at other national labs, INL's is the only one that focuses on feedstock supply and logistics.

"One of the most unique things about this particular PDU is its focus on the feedstock logistics area," said John Ferrell, the feedstock supply team lead for DOE's Biomass Program. "It links all the way from production to product, which gives us a huge value."

### What's next

One outcome of the workshop may be an uptick in such studies and collaborations as more people learn what the PDU can do. Ferrell said he hoped the workshop encouraged participants to form partnerships to utilize the PDU.

In the meantime, workshop organizers and sponsors will use the information and feedback they gleaned from the discussions to develop the DOE's next-generation biomass feedstock roadmap. The current roadmap is roughly 5 years old and in need of an update, since research in this field is progressing.

"For the past decade, research in biomass feedstocks has been focused on reducing costs," said Kenney. "We've made significant progress, but it is time to move beyond cost targets and focus on improving feedstock value."

Specifically, he says, researchers and industrialists are focused on the vision of creating a high-value, national commodity-scale feedstock supply system.

To that end, researchers such as Kenney and others will support DOE's creation of a new roadmap that will describe the vision, identify the most salient barriers and outline a path forward. The document will be completed by spring.



***Workshop participants discussed the breakdown and densification of biomass that will be needed to create a tradable commodity.***



***Paul Bryan, DOE's Biomass Program manager, attended the INL workshop and helped outline national goals for participants.***